

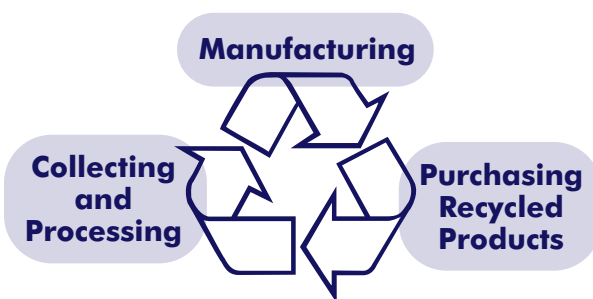
Recycling

What Is Recycling?

Recycling is a series of activities that includes the collection of used, reused, or unused items that would otherwise be considered waste, sorting and processing the recyclable products into raw materials, and remanufacturing the recycled raw materials into new products. Consumers provide the last link in recycling by purchasing products made from recycled content. Recycling also can include composting of food scraps, yard trimmings, and other organic materials. (See the Teacher Fact Sheet titled *Composting* on page 141 for more information.)

How Does Recycling Work?

Many people already recycle items like paper, glass, and aluminum. While these efforts are a vital part of the process, the true recycling path continues long after recyclables are collected from household bins or community drop-off centers. Collecting, processing, manufacturing, and purchasing recycled products creates a closed circle or loop that ensures the overall success and value of recycling.



Collection

How and where recyclables can be collected vary from community to community. Some communities collect from residences, schools, and businesses through:

- **Curbside collection programs**, the most common method. Residents set recyclables,

Key Points

- The latest numbers show that the recycling rate in the United States has reached an all-time high—in 2001 the country recycled 29.7 percent of its municipal solid waste. (EPA, 2003)
- Recycling includes collecting materials and sorting and processing them into recycled raw materials to be remanufactured into new products.
- Recycling reduces the use of virgin materials, reduces the pollution and energy used in manufacturing and processing, saves landfill space, and creates jobs and revenue.
- New methods for the recycling and reuse of certain items, such as computer and electronic equipment, are being developed to prevent waste and save additional materials and energy.
- Recycling can only be effective if people buy recycled-content products.

sometimes sorted by type, on their curbs to be picked up by municipal or commercial haulers.

- **Drop-off centers**, locations where residents can take their recyclables. These centers are often sponsored by community organizations.
- **Buy-back centers**, local facilities where recycled-content manufacturers buy their products back from consumers and remanufacture the used products into new products.



- **Deposit/refund programs**, which require consumers to pay a deposit on a purchased product in a container (e.g., bottle). The deposit can be redeemed when the consumer brings the container back to the business or company for recycling.



Processing

After collection, some recyclables are “processed” and prepared for delivery to manufacturing facilities. Processing usually includes mak-

other commodity, and prices for the materials change and fluctuate with the market. Each MRF has individual requirements about what materials it will accept, but most accept newspapers, aluminum cans, steel food cans, glass containers, and certain types of plastic bottles.

Manufacturing

Once cleaned and sorted, the recyclables move to the next part of the recycling loop—manufacturing. More and more of today’s products are being manufactured with recycled content.

- Recycled cardboard and newspaper are used to make new boxes, papers, and other products such as tissues, paper towels, toilet paper, diapers, egg cartons, and napkins.
- Recycled plastic called PET, found in soft drink, juice, and peanut butter containers, is used to make new products such as carpets, fiberfill (insulating material in jackets and sleeping bags), bottles and containers, auto parts, and paint brushes. Another kind of recycled plastic, HDPE, used in milk, water, detergent, and motor oil containers, can be remanufactured into trash cans, bathroom stalls, plastic lumber, toys, trash bags, and hair combs. Numbers imprinted on the plastic product indicate from which type of plastic the product has been manufactured and how it can be recycled. Not all communities recycle all types of plastic.
- Recycled glass is used again and again in new glass containers as well as in glassphalt (the roadway asphalt that shimmers in sunlight), road filler, and fiberglass.
- Recycled aluminum beverage cans, one of the most successful recyclables, are remade into new cans in as little as 90 days after they are collected. Recycled aluminum cans also can be used in aluminum building materials.
- All steel products manufactured in the United States contain 25 to 30 percent or 100 percent recycled steel, depending on the manufacturing process used.

Follow a Plastic Bottle Beyond the Bin...

After a plastic soda bottle is collected in a recycling bin, it is sorted and transported to a materials recovery facility. There it is cleaned and fed into a granulator that chops it into uniform-sized pieces, called “flakes.” A manufacturer then purchases the flakes and melts them, squeezing the plastic into thin spaghetti-like strands and chopping those strands into small pieces called “pellets.” These plastic pellets are further stretched and squeezed into thin fibers that can be remanufactured into items like clothing, bags, bins, carpet, plastic lumber, hospital supplies, housewares, packaging, shipping supplies, toys, and more. Consumers then complete the recycling loop by purchasing and using these new recycled-content products.

ing sure the materials are sorted properly and that contaminants (i.e., nonrecyclables) are removed. Recyclables are then usually sent to a **materials recovery facility** (MRF, pronounced “murph”) to be further sorted and then processed into marketable commodities for remanufacturing. Recyclables are bought and sold just like any

Recycling in the United States Throughout History

Although the United States has witnessed a major increase in public participation in recycling programs in recent years, industrial and commercial recycling has always made sense economically. The time line below presents a brief glimpse of recycling throughout U.S. history.

Late 1800s to Early 1900s

- Before the days of mass production, the economic climate required people to routinely repair, reuse, and recycle their material possessions.
 - Scrap yards recycled old cars, car parts, and metal goods.
 - The paper industry used old rags as its main source of fiber until the late 19th century.
 - Retailers collected used cardboard boxes for recycling.

1914–1918 and 1939–1945 (WWI and WWII)

- Patriotism inspired nationwide scrap drives for paper, rubber, and other materials to help the war effort.
 - Many farms melted down and recycled iron or metal pieces of rusted machinery for warships, vehicles, and other military machines.
- People even saved grease from meat they cooked, which was used to make munitions.

1960s

- Interest in recycling waned as America's peacetime economy soared. Rising incomes and widespread, affordable, mass-produced goods created the "disposable" society.

1970s

- Environmental awareness rejuvenated the nation's interest in recycling.
- U.S. Environmental Protection Agency (EPA) was established December 2, 1970.
- The first Earth Day was held in 1970, significantly increasing recycling awareness. In the years following, 3,000 volunteer recycling centers opened and more than 100 curbside collection programs were established.
- EPA and some state agencies developed guidelines, technical assistance, and targets for local recycling efforts.

1980s

- The national spotlight fell on monitoring trash due to increased awareness of pollution resulting from poor waste management.
- Federal, state, and local governments became more and more involved in waste management.
- Waste management firms began to offer recycling programs in connection with proposals for new incinerators or landfills.

1990s

- Industry expanded the range of products made from recycled materials instead of virgin raw materials.
- National recycling rate reached double digits (28.2 percent in 1998).

2000s

- EPA sets national goals for reducing and recycling waste.

Recycling Facts

- By recycling 1 ton of paper, we save: 17 trees, 7,000 gallons of water, 463 gallons of oil, 3 cubic yards of landfill space, and enough energy to heat an average home for 6 months.
- Manufacturers can make one extra-large T-shirt out of only five recycled plastic soda bottles.
- Americans throw away enough aluminum every 3 months to rebuild our entire commercial air fleet.
- When one ton of steel is recycled, 2,500 pounds of iron ore, 1,400 pounds of coal, and 120 pounds of limestone are conserved.
- Recycling aluminum cans saves 95 percent of the energy required to make aluminum cans from scratch.
- The amount of aluminum recycled in 1995 could have built 14 aircraft carriers.

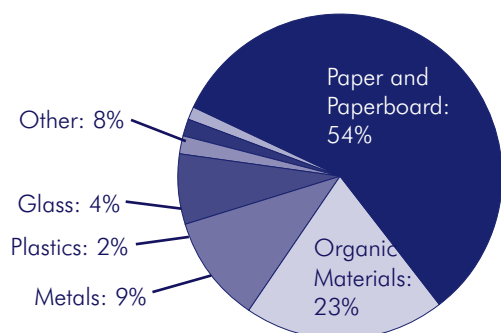
(Sources: Weyerhaeuser Company, 2001; Steel Recycling Institute, 2000; American Forest and Paper Association, 2000; R.W. Beck, 1997; The Can Manufacturers Institute, 1997; Anchorage Recycling Center, 2000; Recyclers' Handbook by Earthworks Group, 1997; EPA, 1997)

Purchasing Recycled Products

The market for recycled materials is the final part of the recycling loop. Recycled products must be bought and used in order for the entire recycling process to succeed.

Recycling and composting activities divert about 62 million tons of material from landfills and incinerators. (See the Teacher Fact Sheets titled *Landfills* on page 165 and *Combustion* on page 169 for more information.) In 2001, this country recycled 29.7 percent of its waste, a rate that has almost doubled over the past 15 years. That's 1.3 pounds per person per day. Of that 29.7 percent, here is the breakdown of what the United States recycled that year:

Materials Recycled in the United States



Source: EPA, 2003

What Are the Benefits of Recycling?

When each part of the recycling loop is completed, the process helps both the environment and the economy. Recycling prevents materials from being thrown away, reducing the need for landfilling and incineration. In addition, the use of recycled materials to manufacture new products prevents pollution caused by the manufacturing of products from virgin materials. Also, using recycled materials for manufacturing decreases emissions of greenhouse gases that contribute to global climate change. Since the use of recycled materials reduces the need for raw material extraction and processing, energy is saved and the Earth's dwindling resources are conserved.

Recent studies indicate that recycling and remanufacturing account for about 1 million manufacturing jobs throughout the country and generate more than \$100 billion in revenue. Many of the employment opportunities created by recycling are in areas of the country where jobs are most needed. Jobs include materials sorters, dispatchers, truck drivers, brokers, sales representatives, process engineers, and chemists.

Recycling in Action

For recycling to work, everyone has to participate in each phase of the loop. From government and industry, to organizations, small businesses, and people at home, all Americans can easily make recycling a part of their daily routine. Below are some ways for individuals to get involved in recycling:

- Learn about and participate in a community recycling program. Know the collection schedule or drop-off location as well as which items are acceptable. Get involved by volunteering with a homeowner's association or community organization to educate neighbors about the recycling program.
- Empty all fluids and remove all lids from bottles and cans when recycling and do not contaminate recycling containers with trash.
- Participate and encourage colleagues to recycle in the containers provided in your school. Initiate a recycling program in your school if one does not exist.
- Make the effort to find recycling opportunities for items, such as plastic packaging, that are not included in your local recycling program.
- Use recyclable products and encourage others to do the same.

What Are the Challenges of Recycling?

Despite its success, the potential of recycling in this country is not yet fully realized. Some plastics, for example, such as bottles and containers, are recyclable in almost any community, but others, such as plastic "peanuts"

used in packaging, usually can not be included in curbside or drop-off recycling programs. These items still end up in the trash because it is not profitable to collect the tons needed for remanufacture into new products.

In addition, the costs of collecting, transporting, and processing recyclables can sometimes be

Is Your School Waste Wise?

WasteWise is a voluntary EPA partnership program that helps businesses, governments, and institutions reduce waste and save money. Since the program began in 1994, WasteWise partners have reduced their municipal solid waste by more than 26 million tons! In 1998 alone, partners saved an estimated \$264 million. Partners include many large corporations, small and medium-sized businesses, hospitals, tribes, and state, local, and federal governments, as well as 87 schools, school districts, colleges, and universities in more than 30 states.

The following are examples of the accomplishments of a few WasteWise partners in the education field. Alden Central School of New York, which educates children from K-12, implemented a comprehensive waste reduction program in all campus buildings. Students and staff eliminated 450 pounds of polystyrene cafeteria trays and dishes by switching to reusable products. They also composted 900 pounds of cafeteria food scraps and 150 pounds of yard trimmings for use as mulch on building grounds. Sligo Adventist School of Maryland also implemented several innovative waste prevention activities including the reduction of more than 1 ton of drink boxes by switching to bulk juice dispensers. Eastern Illinois University reduced the amount of computer paper used on campus by 10 percent and reused 13 tons of office supplies through an internal exchange among employees.

To find out how your school can join the WasteWise program, please call (800) EPA-WISE (372-9473), e-mail at ww@erg.com, or visit the Web site at www.epa.gov/wastewise.

higher than the cost of disposing of these materials as waste. The average cost to process a ton of recyclables is \$50, while the average value of those recyclables on the market is only \$30. Processors often compensate for this discrepancy by charging a set fee for each ton of material they receive or by establishing ongoing contracts with communities or haulers. Efforts to better manage waste and recycling programs are under development. Many communities across the country implement financial incentives to encourage people to recycle. Residents are charged a fee based on the amount of solid

waste they throw away. The more a household recycles, the less garbage it throw outs, and the lower the collection fee it pays.

Finally, recycling facilities are not always a welcome addition to a community. As with other waste management operations, recycling facilities are often accompanied by increased traffic, noise, and even pollution. Community leaders proposing the location for a recycling facility can encourage the NIMBY (Not in My Backyard) sentiment.

Additional Information Resources:

Visit the following Web sites for more information on recycling and solid waste:

- U.S. Environmental Protection Agency (EPA): <www.epa.gov>
- U.S. EPA, Office of Solid Waste site on recycling: <www.epa.gov/epaoswer/non-hw/muncpl/reduce.htm>
- Plug-in To e-Cycling: <www.epa.gov/epaoswer/osw/conserved/plugin>
- U.S. EPA, Office of Solid Waste WasteWise Program site: <www.epa.gov/wastewise>
- U.S. EPA, Office of Solid Waste site on global climate change and recycling: <<http://yosemite.epa.gov/oar/globalwarming.nsf/content/actionswaste.html>>
- U.S. EPA, Office of Solid Waste, Kid's Page: <www.epa.gov/epaoswer/education/kids.htm>
- U.S. EPA, Region 9 Office's Recycling Site for Kids: <www.epa.gov/recyclecity>
- National Recycling Coalition: <www.nrc-recycle.org>
- Institute for Scrap Recycling Industries: <www.isri.org>
- American Plastics Council: <www.plastics.org>
- Steel Recycling Institute: <www.recycle-steel.org/>
- Aluminum Association: <www.aluminum.org>
- Glass Packaging Institute: <www.gpi.org>
- American Forest and Paper Association: <www.afandpa.org>
- Institute for Local Self-Reliance: <www.ilsr.org>
- Rechargeable Battery Recycling: <www.rbrc.org>
- Polystyrene Packaging Council: <www.polystyrene.org>
- Electronic Industries Alliance: <www.eiae.org>

To order the following additional documents on municipal solid waste and recycling, call EPA toll-free at (800) 490-9198 or look on the EPA Web site <www.epa.gov/epaoswer/osw/publicat.htm>.

- *Characterization of Municipal Solid Waste in the United States*
- *Planet Protectors Club Kit* (EPA530-E-98-002)
- *A Collection of Solid Waste Resources*—CD-ROM